

DOCUMENT RESUME

ED 262 956

SE 046 046

TITLE Meeting the Challenge: The Supply of and Demand for Teachers of Mathematics and Science in Minnesota Secondary Schools. Conference Report.

PUB DATE 83

NOTE 20p.; Report of a conference sponsored by Minnesota Board of Teaching and the State Board of Education, in cooperation with the Educational Cooperative Service Unit of the Twin Cities Metropolitan Area (St. Paul, MN, December 7, 1982).

PUB TYPE Collected Works - Conference Proceedings (021)

EDRS PRICE MF01/PC01 Plus Postage.

DESCRIPTORS Conferences; *Educational Planning; Incentives; *Mathematics Teachers; *School Business Relationship; *Science Teachers; Secondary Education; Secondary School Teachers; Teacher Certification; *Teacher Shortage; *Teacher Supply and Demand

IDENTIFIERS *Minnesota

ABSTRACT

In response to a growing concern regarding the supply of and demand for teachers of science and mathematics in Minnesota secondary schools, a conference was held in December 1982. It was intended to encourage collaborative initiatives among policy makers, classroom teachers, school administrators, school board members, college personnel, and representatives of business and industry in pursuing solutions to the problem. This report includes a summary of the key ideas offered by conference presenters, representative questions and comments expressed by conference participants, and a list of persons attending the conference. It is intended to serve as a resource for future continued dialogue. Questions and comments were grouped under the following categories: teacher licensure, education rule, business/education cooperation, college requirement and recruitment, and differential pay and teacher mobility. (MNS)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED262956

SE

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ The document has been reproduced as
received from the person or organization
originating it.

☐ Minor changes have been made to improve
reproduction quality.

* Points of view or opinions stated in this docu-
ment do not necessarily represent official NIE
position or policy.

CONFERENCE REPORT

MEETING THE CHALLENGE

The Supply Of and Demand For
Teachers of Mathematics and Science
in Minnesota Secondary Schools

Sponsored by the

Minnesota Board of Teaching
and the
State Board of Education

in cooperation with the

Educational Cooperative Service Unit
of the Twin Cities Metropolitan Area

Sheraton Midway
St. Paul, Minnesota
December 7, 1982

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

Joanne Hinrichs

SE 046 046

SUMMARY

The Following Highlights

Have Been Prepared By

Dr. Donald A. Johansen, Supervisor, Secondary Education
Minnesota Department of Education

These are offered to you
as a refresher to some
of the key ideas
expressed by the panelists
and not as a complete transcript of the presentations.

INTRODUCTION

In response to a growing concern regarding the supply of and demand for teachers of science and mathematics in Minnesota secondary schools, a conference was held to explore these issues. The Minnesota Board of Teaching and the State Board of Education, in cooperation with the Educational Cooperative Service Unit of the Twin Cities Metropolitan Area, hosted "Meeting the Challenge," a statewide conference held on December 7, 1982, at the Sheraton Midway-St. Paul. This conference provided an opportunity for participants to dialogue with policy makers, classroom teachers, school administrators, school board members, college personnel, and representatives of Minnesota business and industry regarding the teaching of mathematics and science in Minnesota secondary schools. It was intended to encourage collaborative initiatives in pursuing solutions to the growing concern of providing science and mathematics instruction in secondary schools.

This report includes a summary of the key ideas offered by conference presenters, representative questions and comments expressed by conference participants, and a list of persons attending the conference. It is intended that the outcomes of the conference, summarized in this report, serve as a resource for future continued dialogue.

Kenneth L. Peatross, Executive Secretary
Minnesota Board of Teaching
608 Capitol Square Building
550 Cedar Street
St. Paul, Minnesota 55101
(612) 296-2415

January, 1983

Governor Albert H. Quie welcomed the conference participants to the discussion on the concerns for the supply of mathematics and science teachers. He likened the present situation to 1958 when he was a young Congressman in Washington. The same concerns for mathematics and science education of the "Sputnik Era" led to a federal response of increased expenditures. The concern is similar, but the public money is limited to spend on the problem. He predicted that the state and federal budget problem would last for several years. He urged the conference participants to seek creative solutions other than increased public funds. Governor Quie called for the education profession to actively become involved in the solution rather than to resist improvement through apathy, cynicism, and defensiveness. The Governor noted that while we hold the attribute of "equality" most dear it sometimes comes in conflict with another attribute of "merit" which we also hold dear. This may force us to choose between valued conflicting attributes. "We must come to the conclusion of differentiated pay in order to provide attractive salaries for math and science teachers" said Governor Quie.

Dr. John Feda, Minnesota Commissioner of Education, moderated the morning panel of presenters. Dr. Feda introduced the members of the panel with a comment ascribed to Steve Jobs, President of the company which manufactures the popular Apple Computer. Mr. Jobs credited his interest in science and technology to the encouragement he received from a fourth grade teacher.

Dr. Edwin Stueben of the Institute of Technology, University of Minnesota, related high technology to creation of jobs, not replacement of people, although some technology, including robotics, may in fact replace the type of work people do. Dr. Stueben said that computer programming as a skill is not the critical educational need but logic, problem-solving, and understanding scientific principles are the real needs. These skills are developed in academic courses which emphasize analytic skills, such as algebra, geometry, biology, chemistry, and physics. We need to supply the masses of population more standard courses in science and mathematics. Minnesota is fortunate that our basics are sound and the numbers relating to science and mathematics teachers are better than some other states. We need to attract quality science and mathematics students to teaching - we must seize the advantage we have or lose it.

Dr. David Dye, Mathematics Specialist, Minnesota Department of Education, reported to the conference participants concerning information gathered regarding the supply of mathematics teachers in Minnesota. The Minnesota

Department of Education does not require students to earn any credits in mathematics in grades 10-12, although information in 1981-82 shows half of the districts do require mathematics as a local requirement and enrollments indicate 42% of students do enroll in a mathematics class. Twenty-five percent (25%) of seniors have enrolled in three years of college preparatory mathematics. Nationally, there is a decline in the preparation of mathematics teachers and Minnesota is no exception. The decline is not as immediate in Minnesota as in other states, but it is definitely a potential problem. Mathematics teachers are maturing as a group and declining by 7% per year because of age. Because of need to spend four years in preparation to become a mathematics teacher, the solution must begin now in 1983 in order to have an effect on college graduates in 1987.

Mr. Richard Clark, Science Specialist, Minnesota Department of Education, reported that the Minnesota Department of Education does not require science education in grades 10-12 for graduation from high school. However, at this time 80% of Minnesota 10th graders enroll in biology, 43% of Minnesota 11th graders enroll in chemistry, and 20% of Minnesota 12th graders enroll in physics. High school student science enrollment is higher than ten years ago and is consistent with national reports. We are experiencing a growing demand and may indeed have a supply problem of teachers in the near future. The percentage of young science teachers is declining, and the percentage of teachers staying in teaching is declining. Straight line projections for supply and demand provide a dramatic illustration of a shortfall of available teachers. Unless some corrective action is taken, the problem will continue to get worse. Some solutions which have been suggested include:

1. College loans for science teachers.
2. Differentiated pay for science and mathematics teachers.
3. Summer internships in industry.
4. Inservice programs for teachers not adequately licensed.

Dr. Leila Anderson, Superintendent, Bloomington Public Schools, stated that suburban districts have not faced a teacher supply shortage as much as a student declining enrollment problem, with subsequent layoffs of teachers. She asked whether we can form a partnership for progress to seek solutions to licensure problems, to assist in developing meaningful curriculum, to develop and test the most effective delivery system, and to keep pace with the needs of the future. Consideration should be given to teachers on "loan" from industry, differentiated pay, encouraging cooperation, and preserving morale for all teachers. Staff development activities should not be cut or overlooked.

Mr. Jerry Larson, Principal, St. Cloud Apollo Senior High School, noted that at the present time there appears to be no shortage of qualified mathematics and science teachers in St. Cloud. The National Science Foundation and National Defense Education Act had an impact on teacher preparation and salaries. Restrictions on financial resources which limit allowable credit when teachers seek employment in other districts make it appear the education profession penalizes people for preparation and experience. When one considers all factors including economic and emotional resources, the conclusion is that education is in a depression. Teachers are sensitive and react to criticism. Teachers are no longer proud and this negativism is transferred to the students' attitude toward teaching. Why not recommend that the outstanding students in mathematics and science in your school pursue a career in education? If you can answer that question, then you have identified the problem that needs to be answered for the solution to the supply of science and mathematics teachers for our schools in the future.

Ms. Donna Knight, Executive Director of Minnesota Wellspring, introduced a multi-media presentation. Minnesota Wellspring seeks to bring together the creative energies of labor, business, government, and education to create a better life for all citizens. The many superior resources of Minnesota were identified as including: people, energy, transportation, lumber, agriculture, medicine, and education. The organization is only 18 months old and already has achieved a reputation for achieving successful cooperation among its member participants.

Mr. Paul Maltrud, Principal, Detroit Lakes Junior High School, spoke with a wide cross section of people in his community in preparation for the conference. A consensus appeared to suggest that additional financial resources offer the solution to the shortage of teacher supply in mathematics and science. He discovered in discussing the solution with students, that they declined to consider teaching as a career option because education has a poor image. The public, including young people, needs to be convinced teaching is a worthwhile profession.

Mr. John Mitchell, Director, Honeywell Foundation, representing a business which is high tech and interested in quality education for future generations, said that CAD/CAM (computer assisted design computer assisted manufacture) will cause competition for people, including teachers. Private industry has responded to the need by attempting to attract a large segment of the population to education through organizations such as NACME (the National Action Council for Minority Engineers). Mr. Mitchell suggests:

1. Talking to young people about engineer careers as early as third grade;
2. Helping programs already in existence;

3. Identifying, stimulating, young promising students;
4. Sending young engineers from companies such as Honeywell to colleges for personal contacts;
5. Enhancing teaching salaries by summer work in industry;
6. Encouraging competitive salaries;
7. Utilization of community resources.

Mr. Joseph Premo, President, Minnesota Science Teachers Association and Science Consultant for Minneapolis Public Schools, asked how closely our societal values resonate with our actions:

1. Attitudes begin to be formed in elementary school. How much time, effort, money do we allocate for science in elementary schools?
2. To what degree is science recognized in our schools? How many students are assigned laboratory classes? The class size reflects the goals - when class size increases, quality decreases.
3. Opportunity to cooperate with industry would be welcome. Adding to teacher income by summer industry jobs, low interest loans for science teacher college students, increase of equipment money and establishment and adherence to safety standards rather than paying out of science department instructional budget, are ideas which need to be considered.

Mr. Kenneth Queensland, Superintendent, Blue Earth Public Schools, reminded the conference participants that school districts have a great variation in size, which creates special problems for districts with fewer than a classroom size per grade. Small districts and small communities have trouble attracting and retaining quality teachers. Special solutions might need to be applied to these schools' problems.

Ms. Sally Sloan, President, Minnesota Council of Teachers of Mathematics, expressed her concern for professionalism. Some help in solving the problem may come from encouraging teachers who left the profession for marriage to come back by allowing credit for professional activities for other than teaching positions. Ms. Sloan noted that only 18% of mathematics teachers are female.

Dr. Kenneth Vos, Chair, Education Department, College of St. Catherine, noted that mathematics teachers go into other fields and that higher education is the lowest paid education profession of all. Dr. Vos commented that from the college perspective students are not well prepared in mathematics, and that it was expensive to learn basic mathematics at the college level. Suggestions offered were:

1. Retain the existing corps of all teachers;
2. Encourage inducements such as institutes and programs to loan money to teachers;
3. Increase current numbers coming into the profession by encouraging:
 - a. people older than 22 years of age
 - b. summer programs in mathematics and science
 - c. programs for gifted students

Dr. Vos concluded that we spend less to prepare a teacher than we do to educate a third grader.

Mr. Ray Olson, Chairman, Board of Teaching, summarized the thoughts and comments of conference participants by stating that this was an initial attempt to generate thinking and dialogue among concerned people about a serious potential problem. He noted that there is an attitude problem within the education profession, but most of those who have devoted the better part of their lives to teaching are convinced that they like young people, they like to teach, and that it is an honorable profession. The teacher's image has been tarnished and there is need for enthusiasm. A healthy observation gained from this conference is the recognition that the quality of education is our problem, not the schools, not educators, not the profession's problem; but our problem. We all need to contribute to the solution.

QUESTIONS AND COMMENTS

A short period of time remained for questions from the conference participants and answers from the panelists. A great many questions remain unanswered. Those comments and questions have been preserved and may well become the basis for study and preparation in future discussions by concerned committees and groups. Representative questions and comments from conference participants have been divided into five categories: teacher licensure questions, education rule questions, business/education cooperation suggestions, college requirement and recruitment questions and suggestions, and differential pay and teacher mobility questions and comments.

Teacher Licensure Questions

- In the preparation of teachers of physics, there are more important links with mathematics than with biology. Would it not be wise to think of this kind of linkage as an alternative to the present pattern?
- Why must chemistry always be linked with physics for licensure as a high school teacher? Many college students have combinations such as chemistry-biology or chemistry-geology. These combinations should be allowable for licensure purposes.
- How can "altering" requirements for physical science teachers help? The requirements are much too severe to encourage students to pursue a career as a physical science teacher.
- How feasible is it to hire science professionals who are either not licensed or have limited education backgrounds, such as graduates in the area of science and mathematics with future opportunity to become licensed?
- Seriously review how we might legitimize part-time teaching in our high schools by scientists or engineers or graduate students on loan from corporations or colleges without demanding the regular licensure.
- Are we going to see computer science licensure standards soon? Who is working on this? How can we have input?

Education Rule Questions

- The competency level in mathematics of many college students is at only the junior high school level. Should not we mandate competency at the high school level as a minimum requirement?

- If more students were required to complete high school mathematics, maybe courses such as algebra and geometry could be redesigned for slower learners even if they were one and one-half or two year courses. Try a different way of teaching such courses to students who might normally take "consumer mathematics."
- The state requirements should be changed by reducing those such as health, physical education, or social studies (grant some equivalencies or let students test out of some state requirements) and increasing requirements for science and mathematics. (Retrain teachers displaced by assistance from corporations in the retraining effort.)
- If improvement of instruction should begin in the elementary school through inservice of already existing teaching staff, how will this be accomplished? Federal funds for this purpose do not seem available.
- Increase financial aid to school districts that have qualified staff in math and science.
- Allow students to participate in a voluntary science and mathematics testing program. If the school passed the test, then the school could be given supplementary material from the state, such as computers and resource materials. The test standards would be determined by an outside agency.
- Establish a teacher-student ratio of 1 to 15. Stay away from "large" class situations in senior high college preparatory classes in mathematics and science.
- Why don't we use the area high school vocational centers to provide advanced science and mathematics courses? Wouldn't this permit us to share teaching expertise and resources and meet the shortage of teachers?

Business/Education Cooperation Suggestions

- Those involved with mathematics and science are aware of the problem. We need to educate the public at large about science and mathematics needs. How? Should something like television ads be attempted? Would this be an appropriate item for industry?
- Business/industry could supply mathematics and science teachers in return for corporate tax credits.
- Corporations could help provide some of the rewards to make teaching more exciting, such as providing funds for teachers to attend science and mathematics technology conferences, to do summer work for corporations, or to provide funds for field trips.
- How can we increase contact between industry and schools to provide opportunities for mathematics teachers to be employed by industry during the summer months?

- Could we encourage business and industry to assist in the relocation of surplus science and mathematics teachers from one area to those communities where such teachers are in short supply? If business and industry could use such contributions as tax write-offs, they might be induced to share in a worthwhile social-economic-educational experiment.
- Industries might fund summer institutes developed locally, regionally, or statewide, or by subject area and implemented by the State Department of Education or colleges and universities. Assistance could be requested from some good public relations firms to help generate enthusiasm.

College Requirement and Recruitment Questions and Suggestions

- The military and medical people have discovered a great waste in student preparation programs. By developing better screening devices, could we lessen the "mortality" on teacher preparation candidates and perhaps improve quality at the same time?
- What do most colleges and universities require in the fields of mathematics and science from those students who wish to enter? Is there a meaningful average across the country?
- How might we encourage more college students and/or high school students to begin or consider teacher preparation?
- Why don't colleges require high school mathematics and science courses for entrance? Colleges take anyone and then criticize high schools for not teaching them properly. High schools offer mathematics and encourage it, but students look for easy courses to raise their grade point averages.
- Don't we have responsibilities beyond the boundaries of the state? Nationally, teacher shortages do exist. What is our role in meeting these national demands?
- Many speakers have referred to the National Science Foundation Institutes. These took place in the 1960's and early 1970's. Have teachers done anything to keep pace since then? Is there any real evidence that the institutes had the effect of making teachers better?

Differential Pay and Teacher Mobility Questions and Comments

- Pay teachers of mathematics and science more money. Require them to attend school every four years in order to keep differential pay. They would be reimbursed for this additional education.
- What is the teacher union position on differential pay?

- Is an English teacher less important in the development of a scientist than a chemistry teacher?
- How many school districts in Minnesota pay for teacher updating or upgrading of skills and knowledge?
- Give school districts money to allow their science and mathematics faculty to attend conferences and workshops.
- How many school districts hire teachers under extended contracts (12 months)?
- Would school district consolidation allow for higher teacher salaries, fewer unlicensed mathematics and science teachers, and more balanced class sizes?
- Is our pool of women prepared to be teachers declining and/or being drawn into other professional areas?
- Do larger school districts hire mathematics and science teachers away from smaller districts? Will there be more of this in the future?
- Teachers who are put on unrequested leave in one district should be given jobs in other districts at the same or higher level as they would have been paid had they stayed in the original district.
- The problem seems to be more one of logistics than a real shortage, that is, declining enrollment leads to teachers being placed on unrequested leave. These surplus teachers may be needed elsewhere. How do we get them to go?
- Given the relevant stability of the mathematics and science teachers, it follows that innovations must occur basically with the assistance of existing personnel. It makes no sense to speak of upgrading curricula by depending on new teachers. The implication for inservice and general upgrading of pedagogical skills is enormous.

CONFERENCE PARTICIPANTS

James Adams
Department of Mathematics
Mankato State University
Mankato, MN 56001

Beverly Albee
441 Vildmark Court
Eagan, MN 55123

Kenneth Ames, Dean
College of Education
St. Cloud State University
St. Cloud, MN 56301

Charles Anderson
Central High School
Norwood, MN 55368

Leila Anderson, Superintendent
Bloomington Public Schools
8900 Portland Avenue South
Bloomington, MN 55420

Richard Anderson
Minnesota School Boards
Association
Box 119
St. Peter, MN 56082

Ronald Anderson
Bemidji State University
Bemidji, MN 56601

Sabra Anderson
Department of Mathematics
University of Minnesota, Duluth
Duluth, MN 55812

B.Y. Auger
Program Development
3M Center
225-2N-6
St. Paul, MN 55144

Judith Betty
650 Brockton Lane
Plymouth, MN 55447

Robert Bland
College of St. Thomas
2115 Summit Avenue
St. Paul, MN 55105

Karsten Braaten
Route 2
Rice, MN 56367

Lyle Bradley
Science Consultant
Anoka Public Schools
11299 Hanson Blvd. NW
Coon Rapids, MN 55433

Frank Braun
Education Career Development
Office
University of Minnesota
1425 University Avenue
Minneapolis, MN 55414

Gerald Brekke
Gustavus Adolphus College
St. Peter, MN 56082

Robert Brummond
Professor of Physics
Concordia College, Moorhead
Moorhead, MN 56560

Hugh Bryce
Route 3, Box 352
Stageline Road
Hudson, WI 54016

Kent Carlson
708 Riverside Avenue North
Sartell, MN 56377

Phil Carlson
Department of Mathematics
Bethel College
St. Paul, MN 55112

Beverly J. Carpenter
1319 E. 94th Street
Bloomington, MN 55420

Jane Chatterjee
11319 Rich Circle
Bloomington, MN 55437

Ann Chorley
1815 Shadyview Circle
Plymouth, MN 55447

Richard Clark
Science Specialist
Minnesota Department of Education
St. Paul, MN 55101

Lawrence Conroy
Department of Chemistry
207 Pleasant Street SE
University of Minnesota
Minneapolis, MN 55455

Alan Corcoran
7316 W. Shore Drive
Edina, MN 55435

John Coulter, Professor
of Biological Sciences
St. Cloud State University
St. Cloud, MN 56301

Ken Daniels
Super Valu Stores, Inc.
P.O. Box 990
Minneapolis, MN 55440

Casey DeJong
Jefferson High School
14th and Jefferson
Alexandria, MN 56308

Roger Delgehausen
Personnel Licensing
Minnesota Department of Education
St. Paul, MN 55101

Lis Donhowe
101 Capitol Square Building
550 Cedar Street
St. Paul, MN 55101

William Doyle
Bethel College
3900 Bethel Drive
St. Paul, MN 55112

George Droubie
Personnel Licensing
Minnesota Department of Education
St. Paul, MN 55101

Sister Mary Walter Duval
660 Nicollet Avenue
Richfield, MN 55408

David Dye
Mathematics Specialist
Minnesota Department of Education
St. Paul, MN 55101

Adela S. Elwell
Route 8, Box 479
Bemidji, MN 56601

Charles Ernst
Department of Mathematics
St. Cloud State University
St. Cloud, MN 56301

Judy Farmer
Metro ECSU
3602 Highcrest Road
Minneapolis, MN 55418

Paul Farnham
College of St. Thomas
2115 Summit Avenue
St. Paul, MN 55105

John J. Feda
Commissioner of Education
St. Paul, MN 55101

Cathy Foley
Administrative Assistant
Senate Education Committee
Room 328, State Capitol
Aurora Avenue
St. Paul, MN 55155

Bernice Folz
College of St. Thomas
2115 Summit Avenue
St. Paul, MN 55105

Fredrick Foss
Winona State University
Winona, MN 55987

Phyllis Fredlund
104 Skyline Drive
Granite Falls, MN 56241

Marvel Froemming
Department of Mathematics
Moorhead State University
Moorhead, MN 56560

Eugene Gennaro, Professor
of Secondary Education
Peik Hall - University of Minnesota
159 Pillsbury Drive SE
Minneapolis, MN 55455

Hillel Gershenson
University of Minnesota
Minneapolis, MN 55455

Judy Halvorson
John F. Kennedy High School
9701 Nicollet Avenue S.
Bloomington, MN 55420

Freya Hanson
Hanson & Hanson Attorneys at Law
116 North Main Street
Pine Island, MN 55963

Maxine Harris
LaCrescent High School
LaCrescent, MN 55947

A. Dean Hendrickson
Department of Education
Bohannon Hall
University of Minnesota, Duluth
Duluth, MN 55812

Russell Hobbie, Professor
of Physics
Institute of Technology
University of Minnesota
Minneapolis, MN 55455

Peggy House
360 Peik Hall
University of Minnesota
Minneapolis, MN 55455

Raleigh Huizinga
Groves Learning Center
3200 Highway 100
St. Louis Park, MN 55416

Robert Jackson
Mathematics Education
Peik Hall
University of Minnesota
Minneapolis, MN 55455

Ann Jaede
Department of Energy
100 Capitol Square Building
St. Paul, MN 55101

Linda Jeska-Sirlum
Metro ECSU
3602 Highcrest Road
Minneapolis, MN 55418

Donald Johansen, Supervisor
Secondary Education
Minnesota Department of Education
St. Paul, MN 55101

Erling O. Johnson
832 Eastwood Lane
Anoka, MN 55303

William Joyce
International Multifoods
P.O. Box 2942
Minneapolis, MN 55402

Mary Kahrs
Department of Education
Mankato State University
Mankato, MN 56001

Rita Kaplan
Honeywell Inc.
Honeywell Plaza
Minneapolis, MN 55408

Bernard Kaye
100 River Ridge Court
Burnsville, MN 55337

Floyd Keller, Manager
Elementary-Secondary Education
Minnesota Department of Education
St. Paul, MN 55101

Shirley Kelter
St. Mary's College
Winona, MN 55987

Keith Kennedy
St. Cloud State University
St. Cloud, MN 56301

Moon Kim
1549 Lois Drive
Shoreview, MN 55112

Gerald L. Kleve, Deputy Commissioner
Minnesota Department of Education
St. Paul, MN 55101

Donna Knight, Executive Director
Minnesota Wellspring
101 Capitol Square Building
St. Paul, MN 55101

Marilyn Krasowski
275 N. Lexington
Central High School
St. Paul, MN 55104

Jerry Larson, Principal
Apollo High School
St. Cloud Public Schools
St. Cloud, MN 56301

Roger Larson
Mathematics Supervisor
Anoka Public Schools
11299 Hanson Blvd. NW
Coon Rapids, MN 55433

Jerry Lenz
Department of Mathematics
St. John's University
Collegeville, MN 56321

Nelia Lorentzen
1038 Rossman Avenue
Detroit Lakes, MN 56501

Marland Madson, Associate
Professor of Biology
St. Olaf College
Northfield, MN 55057

Norman B. Maguire, Executive Director
MASA
1910 West County Road B, Suite 105
Roseville, MN 55113

Paul Maltrud, Principal
Detroit Lakes Junior High School
702 Lake Avenue
Detroit Lakes, MN 56501

Jerry Mansergh, Director
Metro ECSU
3602 Highcrest Road, Suite 112
Minneapolis, MN 55418

Myrna Marofsky
Metro ECSU
3602 Highcrest Road
Minneapolis, MN 55418

Les Martisko, ECSU Director
Franklin School, Room 102
1000 Broad Street
Mankato, MN 56001

Margaret W. Marvin
Box 100
Warroad, MN 56763

Thomas McCarver, Dean
Graduates Studies in Education
and Community Services
College of St. Thomas
2115 Summit Avenue
St. Paul, MN 55105

John McClellan, Superintendent
Centennial Public Schools
Circle Pines, MN 55014

Effie McKerson
5729 France Avenue South
Edina, MN 55410

John Mitchell, Director
Honeywell Fund
2701 4th Avenue South
Minneapolis, MN 55408

Dan Moriarty
Dan Moriarty Associates
1410 2nd Avenue
Newport, MN 55055

Howard Munson
Winona State University
Winona, MN 55987

Alvin Ollenburger
Department of Professional Ed.
221 Bohannon Hall
University of Minnesota, Duluth
Duluth, MN 55812

Alan Olson
Minnesota Federation of
Teachers
175 Aurora Avenue
St. Paul, MN 55103

James Olson, Associate
Professor of Chemistry
University of Minnesota, Morris
Morris, MN 56267

Norman Olson
613 Pierce Street
Eveleth, MN 55734

Ray Olson, Jr.
1008 Fremont
Anoka, MN 55303

Phyllis O'Malley
2740 Kelly Avenue
Excelsior, MN 55331

Richard O'Rourke
Winona State University
Winona, MN 55987

Duane Orr, Dean
College of Education
Mankato State University
P.O. Box 52
Mankato, MN 56001

Hugh Ouellette
Math Department
Winona State University
Winona, MN 55987

Kenneth L. Peatross, Executive Secretary
Minnesota Board of Teaching
St. Paul, MN 55101

Ron Pinkney
Senior High School
Aurora, MN 55750

Tom Post
Department of Education
University of Minnesota
Peik Hall
Minneapolis, MN 55455

Joseph Premo
Science Consultant
Minneapolis Public Schools
807 Northeast Broadway
Minneapolis, MN 55413

Kenneth Queensland, Superintendent
Blue Earth Public Schools
East 6th Street
Blue Earth, MN 56013

The Honorable Albert H. Quie
Governor
Room 130 State Capitol
St. Paul, MN 55155

Theresa Reardon
Academy of the Holy Angels
6600 Nicollet Avenue
Richfield, MN 55423

William J. Ridley
Control Data Corporation
8100 - 34th Avenue South
P.O. Box O-HQ A03H
Minneapolis, MN 55440

Dennis Rislove
P.O. Box 266
Rushford, MN 55071

William P. Schneider
2420 16th Avenue Northwest
Rochester, MN 55901

Duane Sea, Associate
Professor of Physics
Bemidji State University
Bemidji, MN 56601

Linda Skon
Metro ECSU
3602 Highcrest Avenue
Minneapolis, MN 55418

Sally Sloan
Mathematics Consultant
Minneapolis Public Schools
807 Northeast Broadway
Minneapolis, MN 55413

Louis R. Smerling
2552 W. Lake of the Isles Blvd.
Minneapolis, MN 55405

Gerry Smith
Department of Mathematics
Bemidji State University
Bemidji, MN 56601

Elmer Sorenson
Education Department
Southwest State University
Marshall, MN 56258

Jack Sorteberg
Burnsville High School
600 East Highway 13
Burnsville, MN 55337

Richard Stanford
Educational Liaison
Northern States Power
414 Nicollet Mall
Minneapolis, MN 55401

George Starr
Professor of Education
College of Education
University of Minnesota
Duluth, MN 55812

Harriet Stubbs
1037 Bidwell Street
West St. Paul, MN 55118

Edwin Stueben, Associate Dean
Institute of Technology
University of Minnesota
106 Lind Hall
207 Church Street SE
Minneapolis, MN 55455

Phillip Tenney, Executive Director
MASSP
1910 West County Road B, Suite 109
St. Paul, MN 55113

William Thomas, Dean
Education and Regional Services
Moorhead State University
Moorhead, MN 56560

Bill Tomhave
Department of Mathematics
University of Minnesota, Morris
Morris, MN 56267

Thomas Tommet
College of St. Thomas
2115 Summit Avenue
St. Paul, MN 55105

Lowell Tornquist
Minnesota Department of Education
St. Paul, MN 55101

Richard Traugott
Metro ECSU
3602 Highcrest Avenue
Minneapolis, MN 55418

Dean Turner, Dean
College of Mathematics and
Science
Mankato State University
Mankato, MN 56001

Joe Van Wie
Department of Mathematics
Southwest State University
Marshall, MN 56258

Kenneth Vos, Chairman
Department of Education
College of St. Catherine
2004 Randolph Avenue
St. Paul, MN 55105

Gregory Waddick
Assistant Commissioner
Minnesota Department of Education
St. Paul, MN 55101

Judith Wain
Minnesota Department of Education
St. Paul, MN 55101

Kay Walker
Office of the Governor
Room 130 State Capitol
St. Paul, MN 55155

Martha Wallace
St. Olaf College
Northfield, MN 55057

Patricia A. Weber
3006 Linden Avenue
Slayton, MN 56172

John Wenger
Concordia College, St. Paul
St. Paul, MN 55104

Jim Whitney
Hopkins High School
2400 Lindbergh Drive
Hopkins, MN 55343

Sally Wolf
1051 37th Avenue North
St. Cloud, MN 56301

Wayne Wolsey
Professor of Chemistry
Macalester College
1600 Grand Avenue
St. Paul, MN 55105

Ralph Wolters
275 N. Lexington
Central High School
St. Paul, MN 55104